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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Applicants	:	LeRoy Dickson John Groot Carl Harry Knowles Thomas Amundsen
Serial No.	:	08/943,288
Filing Date	:	October 3, 1997
Title of Invention	:	HOLOGRAPHIC LASER SCANNING SYSTEM AND PROCESS AND APPARATUS AND METHODS FOR DESIGNING AND CONSTRUCTING THE SAME
Examiner	:	Thien Minh Le
Group Art Unit	:	2876
Attorney Docket No.:		108-001K

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and Trademarks
Washington, DC 20231

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. 1.97

Sir:

In order to fulfill Applicant's continuing obligation of candor and good faith as set forth in 37 C.F.R. 1.56, Applicant submits herewith an Information Disclosure Statement prepared in accordance with 37 C.F.R. Sections 1.97, 1.98 and 1.99.

The disclosures enclosed herewith are as follows:

U.S. PUBLICATIONS

NUMBER	FILING DATE	TITLE
5,557,093	December 28, 1994	COMPACT PROJECTION LASER SCANNER FOR PRODUCING A NARROWLY CONFINED SCANNING VOLUME FOR OMNI-DIRECTIONAL SCANNING OF CODE SYMBOLS THEREIN, WHILE PREVENTING UNINTENTIONAL SCANNING OF CODE SYMBOLS ON NEARBY OBJECTS
5,555,130	June 6, 1995	HOLOGRAPHIC SCANNING

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5,550,655	April 22, 1994	LASER BEAM OPTICAL SCANNER
5,504,595	April 8, 1994	HOLOGRAPHIC SCANNING
5,498,862	April 18, 1994	SIDE SCANNING BAR CODE READER WITH VERTICAL AND HORIZONTAL SCAN PATTERS
5,483,075	November 1, 1994	ROTARY SCANNING APPARATUS
5,471,326	April 20, 1993	HOLOGRAPHIC LASER SCANNER AND RANGEFINDER
5,422,744	June 12, 1992	BAR CODE INCORPORATED INTO HOLOGRAPHIC DISPLAY
5,361,158	May 20, 1993	MULTIPLE SOURCE OPTICAL SCANNER
5,357,101	September 15, 1992	ELECTRO-OPTICAL TRANSCEIVER WITH NONIMAGING CONCENTRATOR
5,306,899	June 12, 1992	AUTHENTICATION SYSTEM FOR AN ITEM HAVING A HOLOGRAPHIC DISPLAY USING A HOLOGRAPHIC RECORD
5,216,230	January 3, 1992	LASER BEAM SCANNER
5,206,491	February 28, 1991	PLURAL BEAM, PLURAL WINDOW MULTI-DIRECTIONAL BAR CODE READING DEVICE
5,162,929	July 5, 1991	SINGLE-BEAM MULTICOLOR HOLOGON SCANNER
5,148,008	November 12, 1991	MARK READING DEVICE WITH CYCLICLY VARYING POWER
5,124,537	October 29, 1990	OMNI-DIRECTIONAL BAR CODE READER USING VIRTUAL SCAN OF VIDEO RASTER SCAN MEMORY
4,973,112	December 1, 1988	HOLOGON DEFLECTION SYSTEM HAVING DISPERSIVE OPTICAL ELEMENTS FOR SCAN LINE BOW CORRECTION, WAVELENGTH SHIFT

		CORRECTION AND SCANNING SPOT ELLIPTICITY CORRECTION
4,957,336	November 10, 1988	LASER BEAM SCANNER AND ITS FABRICATING METHOD
4,904,034	January 29, 1988	SCANNING APPARATUS
4,800,256	December 8, 1986	HOLOGRAPHIC SCANNER HAVING ADJUSTABLE SAMPLING RATE
4,794,237	November 10, 1986	MULTIDIRECTIONAL HOLOGRAPHIC SCANNER
4,790,612	September 15, 1986	METHOD AND APPARATUS FOR COPYING HOLOGRAPHIC DISKS
4,758,058	January 12, 1987	HOLOGRAPHIC DISK SCANNER HAVING SPECIAL POSITION-INDICATING HOLOGRAMS
4,753,502	December 24, 1985	HOLOGRAPHIC LASER BEAM SCANNER
4,748,316	June 13, 1986	OPTICAL SCANNER FOR READING BAR CODES DETECTED WITHIN A LARGE DEPTH OF FIELD
4,610,500	August 16, 1984	HOLOGON LASER SCANNER APPARATUS
4,591,242	February 13, 1984	OPTICAL SCANNER HAVING MULTIPLE, SIMULTANEOUS SCAN LINES WITH DIFFERENT FOCAL LENGTHS
4,591,236	February 13, 1984	OPTICAL SCANNER WITH BEAM DIRECTING HOLOGRAMS AT WINDOW
4,548,463	February 13, 1984	HOLOGRAPHIC SCANNER CONTROL BASED ON MONITORED DIFFRACTION EFFICIENCY
4,364,627	September 7, 1979	METHOD AND SYSTEM FOR CONSTRUCTING A COMPOSITE HOLOGRAM

4,429,946	July 22, 1982	METHOD AND SYSTEM FOR CONSTRUCTING A COMPOSITE HOLOGRAM
4,428,643	April 8, 1981	OPTICAL SCANNING SYSTEM WITH WAVELENGTH SHIFT CORRECTION
4,416,505	October 26, 1981	METHOD FOR MAKING HOLOGRAPHIC OPTICAL ELEMENTS WITH HIGH DIFFRACTION EFFICIENCIES
4,415,224	June 8, 1981	HOLOGRAPHIC SCANNER DISC WITH DIFFERENT FACET AREAS
4,378,142	June 23, 1980	HOLOGRAM MADE BY USING A PLURALITY OF SPHERICAL WAVES AND A DEVICE FOR LASER BEAM SCANNING BY USING THE HOLOGRAM
4,364,627	September 7, 1979	METHOD AND SYSTEM FOR CONSTRUCTING A COMPOSITE HOLOGRAM
4,333,006	December 12, 1980	MULTIFOCAL HOLOGRAPHIC SCANNING SYSTEM
4,243,293	July 3, 1978	HOLOGRAPHIC SCANNER INSENSITIVE TO MECHANICAL WOBBLE
4,113,343	May 18, 1977	HOLOGRAPHIC OPAQUE DOCUMENT SCANNER
4,026,630	December 23, 1975	SCANNING APPARATUS USING HOLOGRAPHIC BEAM DEFLECTOR

PUBLISHED SEARCH REPORT

Publication No.	Publication Date	Title
PCT/US96/20525	12/18/96	INTERNATIONAL SEARCH REPORT

PATENT PUBLICATIONS

Publication No.	Publication Date	Title
EP 0731 417 A2	11/09/96	SCAN MODULE FOR OPTICAL SCANNER
DE 3421-705 A 1	04/24/86	LASER SCANNING OBJECTIVE WITH HOLOGRAM FOR COMPACT DISC PLAYER HAS SPHERICAL AND CHROMATIC ABERRATIONS CORRECTED BY HOLOGRAM AND COMA BY CONCAVE MENISCUS FACING IMAGE
Kukai No. 53-75950	07/05/78	FORMATION OF HOLOGRAM
Kukai No. 54-104849	08/17/79	LIGHT BEAM SCANNER
56-47019 A	04/28/81	ABERRATION CORRECTING METHOD OF HOLOGRAM SCANNER
Kukai No. 57-192920 A	11/27/82	SCANNING OPTICAL SYSTEM FOR COMPENSATING PLANE FALLING

TECHNICAL PUBLICATIONS

"Holoscan Model 2100 Scanner -- A Multi-function Bar Code Scanner for the Industrial Market," by Holoscan, Inc., 2 pages, circa 1994.

"Disk Options for the Model 2100 Holographic Scanner (Raster)" -- Specification sheets, Holoscan, Inc., 9 pages, circa 1994.

"Holographic Bar Code Scanning" by LeRoy D. Dickson, Holoscan, Inc., 16 pages, circa 1994.

"Three-Terminal Adaptive Nematic Liquid-Crystal Lens Device," by Nabeel A. Riza and Michael C. DeJule, Optical Society of America, Optics Letter, Vol. 19, No. 14, July 15, 1994, 3 pages.

IBM Technical Disclosure Bulletin, Vol. 29, No. 7, 12/86 entitled "Dual-Purpose Holographic Optical Element for a Scanner," 2 pages.

IBM Technical Disclosure Bulletin, Vol. 27, No. 5, 10/84 entitled "Chromatic Correction for a Laser Diode/Holographic Deflector" by G.T. Sincerbox, 2

pages.

IBM Technical Disclosure Bulletin, Vol. 26, No. 12, 5/84 entitled "Aberrant Holographic Focusing Element for Post-Objective Holographic Deflector" by L.D.Dickson, 2 pages.

IBM Technical Disclosure Bulletin, Vol. 27, No. 4A, 9/84 entitled "Hand-Held Holographic Scanner Having Highly Visible Locator Beam," by R.T. Cato, 2 pages.

IBM Technical Disclosure Bulletin, Vol. 23, No. 9, 2/91 entitled "Correction of Astigmatism for Off-Axis Reconstruction Beam Holographic Deflector" by L.D. Dickson, 2 pages.

Fujitsu Scientific & Technical Journal, Vol. 15, No. 4, 12/79, pp. 59-76 entitled "Hologram Scanner for POS Bar Code Symbol Reader."

The Bell System Technical Journal, Volume 48, No. 9, November 1969 entitled "Coupled Wave Theory for Thick Hologram Gratings," pp. 2909-2917.

Fujitsu SlimScan™ Holographic Slot Scanner, Fujitsu Systems of America, 4 pages, circa 1991.

Photon, Inc. publication entitled "BeamScan Models 1180, 1280, 2180 Precise Measures of Beam Size and Profiles," circa 1994.

IBM Journal of Research and Development, Vol. 26, No. 2, March 1982, entitled "Holography in the IBM 3687 Supermarket Scanner, by L.D. Dickson, G.T. Sincerbox and A.D. Wolfheimer.

STATEMENTS OF PERTINENCE

U.S. Patent No. 5,557,093 to Knowles, et al. discloses a polygon-based laser projection scanner, in which a narrowly confined laser scanning volume is produced for omni-directional scanning of bar code symbols located therein, while preventing inadvertent scanning of code symbols on nearby objects.

U.S. Patent No. 5,555,130 to Marom, et al. discloses a holographic scanning system for producing a bidirectional-type raster scanning pattern.

U.S. Patent No. 5,550,655 to Kayashima, et al. discloses a holographic laser scanning system, in which pairs of holograms are provided on its scanning disc in order to increase the diffraction efficiency for P-polarized light as high as for S-polarized light, thereby preventing the reduction of light on the image forming surface of the system.

U.S. Patent No. 5,504,595 to Marom, et al. discloses a holographic

scanning system for producing a raster scanning pattern having scanlines with an improved degree of straightness.

U.S. Patent No. 5,498,862 to Edler discloses a polygon-based laser scanning system, in which a hologram is used to convert a horizontal scanning pattern into a vertical scanning pattern.

U.S. Patent No. 5,483,075 to Smith et al. discloses a rotary scanning for use in optically detecting a plurality of samples disposed in a plurality of separation lanes arranged in a non-planar array.

U.S. Patent No. 5,422,744 to Katz et al. discloses a holographic label in which a bar code symbol is holographically recorded.

U.S. Patent No. 5,471,326 to Hall et al. discloses an obstacle avoidance system which uses a disc-shaped HOE comprising two holograms for scanning a laser beam in range finding applications. The holograms are arranged so that the diffraction efficiency of the HOE is the product of the efficiencies of the two separate holograms.

U.S. Patent No. 5,361,158 to Tang discloses a polygon-based bar code symbol scanning system, in which a plurality of scanning light sources are used in order to increase the total depth of field and density of the overall scan pattern produced therefrom by way of orienting the individual depths of field end-to-end or in an overlapping fashion.

U.S. Patent No. 5,357,101 to Plesko discloses a hand-held bar code reader containing an electro-optical device, comprising a light collection element, an integral filter, a photo-diode and a mounting assembly combined in a miniature package.

U.S. Patent Nos. 5,306,899 and 5,422,744 to Morom, et al. discloses embodying a bar code symbol structure within a holographic display label in order to improve security for holographic labels.

U.S. Patent No. 5,216,230 to Nakazawa discloses a laser beam scanner comprising a distance measuring unit for measuring the distance from the scanner to the object to be scanned, and a laser scanner unit for producing a laser scanning beam whose focal point is adjusted to focus on the object to be scanned.

U.S. Patent No. 5,206,491 to Katoh, et al. discloses a polygon-based bar code reading system, in which a plurality of laser sources and mirrors are used to project a plurality of laser sources and mirrors are used to project a plurality of laser scanning patterns through multiple scanning windows in order to produce a multidirectional scanning pattern.

U.S. Patent No. 5,162,929 to Roddy, et al. discloses a single-beam multicolor holographic laser scanner for use in reading image information. As disclosed, the scanner has a scanning disc with holographic facets (multiplexed gratings) that are optimized to the different wavelengths of light contained in a single, plural-wavelength input laser beam.

U.S. Patent Nos. 5,148,008 to Takenaka discloses a hand-held bar code symbol scanner, wherein the output of the laser scanning beam is cyclically varied after each successive scan in order to improve depth-of-field of the scanner.

U.S. Patent No. 5,124,537 to Chandler, et al. discloses a omni-directional bar code symbol reader, in which captured images of bar code symbols stored in digital memory are scanned in such a manner to create a virtual raster-type scanning pattern which is the equivalent scanning pattern of a mechanical laser scanner.

U.S. Patent No. 4,973,112 to Kramer discloses a holographic laser scanner, wherein: a scan-line bow compensation (holographic) grating is disposed in a non-parallel relationship with a holographic scanning disc (in the post-deflection path of a diffracted beam) in order to correct to scanline "bow" correction; a wavelength compensation grating is disposed in a non-parallel relationship with a holographic scanning disc (in the pre-deflection path of a diffracted beam) in order to correct for wavelength shift; and a prism is disposed between the holographic scanning disc and the bow compensation grating in order to correct for scanning spot ellipticity.

U.S. Patent No. 4,957,336 to Hasegawa, et al. discloses a laser beam straight-line scanner for use in a laser printer, wherein an aberration-correcting holographic lens 1 is disposed between the semiconductor laser 2 and the holographic scanning disc 3, as shown in Fig. 2, for performing beam shaping, suppression of scanning beam jitter due to mode hoping, and "coma" aberration correction.

U.S. Patent No. 4,904,034 to Narayan, et al. discloses a holographic laser scanner for use in a laser printer, wherein an arrangement of prisms are disposed between the laser source and holographic scanning disc ("hologon") in order to control laser beam spot size and orientation at the focal point (e.g., the target).

U.S. Patent No. 4,800,256 to Broockman, et al. discloses a holographic laser scanning system for use in a laser printer, wherein the holographic scanning disc is provided with a data track for generating a signal indicating which holographic scanning facet is being used to generate a scanline, and for producing a sampling signal having a frequency related to the focal length of the identified facet in order to optimize light collection and detection operations.

U.S. Patent No. 4,794,237 to Ferrante discloses a multidirectional holographic scanner having a holographic scanning disc supporting a plurality of holograms. As disclosed, each of the holograms generates an individual scan beam having a slightly different focal length and direction angle from that of other holograms.

U.S. Patent No. 4,790,612 to Dickson discloses a one-step method of copying a master holographic disc having a plurality of scanning facets.

U.S. Patent No. 4,758,316 to Dickson discloses holographic laser scanning system, wherein the holographic scanning disc is designed to produce scanlines having a predetermined focal length and focal zone, such that the focal zone of each generated scanline overlaps the focal point of at least one adjacent scan line, thereby scanning bar code symbols with laser beams having various beam cross-sections for the purpose of "smoothing out" the effects of paper (surface) noise.

U.S. Patent No. 4,758,058 to Cato, et al. discloses a holographic laser scanning system, wherein the holographic scanning disc is provided with position-indicating holograms which redirect the laser beam along desired paths on the same side of the scanning disc as the laser, for use in generating signals indicative of the current disc position signals.

U.S. Patent No. 4,753,502 to Ono discloses a holographic scanning system having a scanning disc with holograms capable of producing long scanlines while using a restricted diffraction angle.

U.S. Patent No. 4,610,500 to Kramer discloses a holographic laser scanning system, wherein the holographic scanning disc is enclosed by a removable cover to which lenses and the like are mounted.

U.S. Patent No. 4,591,242 to Broockman, et al discloses a holographic laser scanning system, wherein two or more solid state lasers are modulated at unique frequencies and passed through different focusing lenses before being scanned by a single holographic scanning disc in order to produce multiple simultaneous scan patterns in which the scanlines have different focal lengths. The resulting multi-frequency signal at the detector is applied to a plurality of band-pass filters to separate the returned signal into a plurality of separately decodable signals.

U.S. Patent No. 4,591,236 to Broockman, et al discloses a holographic laser scanning system, wherein holographic films are secured to the scanning window in order to alter the path of the laser beams at the window to provide scanning beams suitable for rear or side scanning of label carrying products.

U.S. Patent No. 4,548,463 to Cato, et al. discloses holographic laser scanning system, wherein certain operating parameters thereof (e.g., video amplifier gain and/or semiconductor laser current) are adjusted on a real-time basis as a function of the actual diffraction efficiency of the facet region aligned with the incident laser beam. As disclosed, the zero order component of the beam is measured to determine the diffraction efficiency of each holographic facet.

U.S. Patent No. 4,364,627 Haines discloses a technique for recording a narrow lenticular hologram.

U.S. Patent No. 4,429,946 and 4,364,627 to Haines disclose a method of making narrow lenticular holograms for a composite drum-shaped hologram.

U.S. Patent No. 4,428,643 to Kay discloses a holographic laser scanning system, wherein a linear diffraction grating is mounted between the laser diode and a holographic scanning disc supporting linear diffraction gratings, in order to compensate for wavelength shifts in the laser beam.

U.S. Patent 4,416,505 to Dickson discloses a method of making holographic optical elements with high diffraction efficiencies.

U.S. Patent No. 4,415,224 to Dickson discloses a holographic laser scanning system, wherein the areas of the holographic facets on the scanning disc are varied as a function of the beam elevation angle and beam path length in order to reduce variations in the amount of light collected through different facets.

U.S. Patent No. 4,378,142 to Ono discloses a method of making a hologram by making a plurality of coherent spherical-wave beams interfere with one after another to provide a multiplicity of interference fringe configurations.

U.S. Patent No. 4,364,627 to Haines discloses a method for making a composite hologram from individual narrow holograms, wherein during hologram construction the image is predistorted to account for a wavelength change if one exists between construction and reconstruction.

U.S. Patent No. 4,333,006 to Gorin, et al. discloses a holographic laser scanning system, wherein the holographic scanning disc has a first set of holograms for generating individual scan beams having a slightly different focal length and direction angle from that of the other holograms. Light reflected from a bar code symbol is collected (i.e., focused) by a second set of holograms mounted on the scanning disc.

U.S. Patent No. 4,243,293 to Kramer discloses a holographic laser scanning system, wherein the holographic scanning disc is insensitive to mechanical wobbling about its axis of rotation.

U.S. Patent No. 4,113,343 to Pole, et al. discloses holographic laser scanning system, wherein a holographic scanning cylinder, having holographic facets are mounted on the rim thereof for focusing the laser beam to its target and focusing reflected light to a stationary hologram above the cylinder focusing onto a photodetector.

U.S. Patent No. 4,026,630 to Wollenmann discloses a holographic laser scanning system, wherein a holographic scanning disc is used to scan a laser beam along a predetermined scanning pattern.

Foreign Patent No. EPO 0 731 417 A 2 to Stern, et al. discloses a miniature laser scanning module, wherein the laser beam output of a vertical cavity surface emitting laser diode (VCSEL) is shaped using a holographic optical element (HOE) and/or Fresnel lens.

Foreign Patent No. DE 3421-705 A 1 to Weingartner discloses a laser scanning optics assembly for use in a compact disc player, wherein a lens element with spherical surfaces is combined with a hologram for correcting lens aberrations.

Foreign Patent No. 53-75950 to Fujitsu, et al. discloses a method of making an astigmatism-correcting hologram for use in a bar code symbol reader, in order to reduce fluctuations in focal distance and improve the reading accuracy of bar code symbols.

Foreign Patent No. 54-104849 to Nippon Denki, et al. discloses a 1-D type holographic scanning mechanism, wherein the laser beam produced from a laser is focused through a lens and then projected through a hologram which is moved in a rectilinear manner in order to achieve scanning of the laser beam along one dimension. As disclosed, the hologram enables reduction in aberrations of the scanning spot.

Foreign Patent No. 54-122865 to Nippon Denki, et al. discloses a method of making an aberration-correcting hologram for use in a holographic laser scanner.

57-192920 to Hitachi Seisakusho, et al discloses the use of a cylindrical lens in combination with a scanning lens to focus a light beam while reducing astigmatism during scanning.

In "Optical Scanning" (1991), LeRoy Dickson et al disclose at pages 159-197, an introduction to the principles of holographic laser scanners for bar code symbol readers, their design and construction. In Section 4.8.2, at pages 205-209 and Figures 4.31 and 4.32, several prior art applications are shown for industrial holographic laser scanners, wherein an overhead large-depth-of-field holographic scanner (i.e., the IBM 7636 Holographic Laser Scanner included a single HeNe tube laser and a holographic scanning disc having single holographic facets (HOEs). Two different versions (i.e. options) of the IBM 7646 holographic scanner were produced.

In Option 1, the IBM 7636 Scanner functioned as a multiple-focal-place, large-depth-of-field (30 inches) scanner by employing a holographic scanning disc having sixteen holographic facets, each having a different focal length but same elevation angle to produce sixteen scanlines each being focused in a different focal plane, with the focal zones between neighboring focal planes overlapping in order to reduce the effects of paper noise. Notably, in this version of the IBM 763 Scanner, the area of each facet varied as a function of the beam elevation angle and beam path length in order to reduce variations in the amount of light collected through different facets, as taught in U.S. Patent No. 4,415,224 to Applicant

LeRoy Dickson.

In Option 2, the IBM 7636 Scanner functioned as raster-type scanner by employing a holographic scanning disc having sixteen holographic facets, each having the same focal length but different elevation angle to produce a sixteen scanline raster-type scanning patter within a single focal plane. This raster-type scanning pattern was designed for reading the AIAG shipping/parts identification label in a picket-fence orientation.

On Page 207 of "Optical Scanning" (1991), LeRoy Dickson discloses that "the multiple-focal-plane, large-depth-of-field feature, combined with the overlapping-focal-zone feature, should provide improved performance in just about any bar code scanning application due to the greater probability of getting a good scan line through the code and the reduced sensitivity to paper noise in the code and substrate."

The product features and benefits of the prior art Holoscan M odel 2100 Industrial Bar Code Scanner are described in detail in the three 1994 product brochures entitled (1) "Holoscan Model 2100 Scanner-- A Multi-function Bar Coder Scanner for the Industrial Market" (2 pages), (2) "Using Tomorrow's Technology to Solve Today's Problems" (6 pages) by Holoscan, Inc. And (3) "Model 2100 Industrial Bar Code Scanner -- High Resolution at Extended Range with Exceptional Depth of Field" (2 pages). As disclosed in each of these product brochures, the Holoscan Model 2100 Holographic Scanner is very similar to the IBM 7636 Holographic Laser Scanner in that it used a single HeNe laser tube and a holographic scanning disc having sixteen facets are used to produce various types of laser scanning patterns. The primary difference between the Holoscan Model 2100 Scanner and the IBM 7636 Scanner is that the Holoscan Model 2100 Scanner is designed to permit its holographic scanning disc to be easily changed, as the Application requires, whereas the IBM 7636 scanner did not provide for such disc interchange.

As disclosed in the 1994 Holoscan product brochure entitled "Disc Options for The Model 2100 Holographic Scanner" (9 pages) by Holoscan, Inc., the Holoscan Model 2100 Scanner included several holographic scanning disc options for producing various types of laser scanning patterns. Each of these scanning disc options will be described in detail below.

As indicated on page 1 of this 1994 Holoscan, Inc. product brochure, scanning disc option R1 provided a holographic scanning disc having sixteen holographic optical elements for producing a sixteen line raster scanning pattern in a single focal plane, with a depth of field of six inches and scanning speed of 1000 scans/second.

As indicated on page 1 of this 1994 Holoscan, Inc. product brochure, scanning disc option R3 provided a holographic scanning disc having sixteen holographic optical elements for producing a four line raster scanning pattern in dual focal planes, with a depth of field of six inches and scanning speed of 1000 scans/second. Notably, in this arrangement, the dual focal planes were produced by modifying the focal length of the

incident laser beam on the scanning disc through the use of external optics.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H1 provided a holographic scanning disc having sixteen holographic optical elements for producing a single scanline pattern in sixteen different focal planes, providing the scanner with a depth of field of thirty inches and scanning speed of 125 scans/second.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H2 provided a holographic scanning disc having fifteen holographic optical elements for producing a single scanline pattern in five different focal planes, repeated three times per revolution of the disc, providing the scanner with a depth of field of six inches for high resolution bar codes and scanning speed of 190 scans/second.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H3 provided a holographic scanning disc having sixteen holographic optical elements for producing a single scanline pattern in four different planes, repeated four times per revolution of the disc, providing the scanner with a depth of field of twelve inches and scanning speed of 250 scans/second.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H4 provided a holographic scanning disc having sixteen holographic optical elements for producing a single scanline pattern in four different focal planes, repeated four times per revolution of the disc, providing the scanner with a depth of field of thirty-two inches and scanning speed of 250 scans/second.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H5 provided a holographic scanning disc having sixteen holographic optical elements for producing a single scanline pattern in two different focal planes, repeated eight times per revolution of the disc, providing the scanner with a depth of field of thirty-one inches and scanning speed of 500 scans/second.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H6 provided a holographic scanning disc having sixteen holographic optical elements for producing a single scanline pattern in two different focal planes, repeated eight times per revolution of the disc, providing the scanner with a depth of field of fifteen inches and a scanning speed of 500 scans/second.

As indicated on page 2 of this 1994 Holoscan, Inc. product brochure, scanning disc option H7 provided a holographic scanning disc having sixteen holographic optical elements for producing a single scanline pattern in a single focal plane, repeated sixteen times per revolution of the disc, providing the scanner with a depth of field of six inches and scanning speed of 1000 scans/second.

"Holographic Bar Code Scanning" (1994) by LeRoy D. Dickson discloses an overview on how holographic laser scanners operate and also how the

Holoscan Model 2100 (and its 10 holographic scanning disc options) operate to produce their scanning patterns (9 pages).

"Three-Terminal Adaptive Nematic Liquid-Crystal Lens Device," by Nabeel A. Riza and Michael C. DeJule, discloses a nematic liquid crystal lens device capable of varying its focal length from infinity to 12 centimeters by control voltages applied to the thin-film resistor network of the device.

IBM Technical Disclosure Bulletin, entitled "Dual-Purpose Holographic Optical Element for a Scanner" discloses holographic laser scanning system, wherein a holographic optical element being is used to redirect an outgoing laser scanning beam while collecting/redirecting incoming or reflected light.

IBM Technical Disclosure Bulletin, entitled "Chromatic Correction for a Laser Diode/Holographic Deflector" by G.T. Sincerbox discloses a holographic laser scanning system, wherein a fixed spatial frequency holographic optical element is disposed parallel to the holographic scanning disc in order to compensate for wavelength variations in the incident laser beam and thereby minimize dispersion.

IBM Technical Disclosure Bulletin, entitled "Aberrant Holographic Focusing Element for Post-Objective Holographic Deflector" by L.D. Dickson discloses a holographic laser scanning system, wherein a holographic lens is mounted below the scanning disc in order to eliminate aberrations introduced by the scanning disc.

IBM Technical Disclosure Bulletin, entitled "Hand-Held Holographic Scanner Having Highly Visible Locator Beam," by R.T. Cato discloses a hand-held holographic scanning system, wherein a stationary holographic optical element is used to shape and focus the scanning beam, and wherein it is mentioned that it is possible to use a movable holographic element for deflecting the scan beam.

IBM Technical Disclosure Bulletin, entitled "Correction of Astigmatism for Off-Axis Reconstruction Beam Holographic Deflector" by L.D. Dickson discloses a method of making a holographic scanning disc that eliminates the cause of scan spot astigmatism produced by holographic optical elements on a holographical scanning disc.

Fujitsu Scientific & Technical Journal, entitled "Hologram Scanner for PoS Bar Code Symbol Reader discloses a holographic laser scanning system for use in POS environment, wherein a lattice-type scan pattern is generated, as shown in Fig. 16 thereof.

The Bell System Technical Journal entitled "Coupled Wave Theory for Thick Hologram Gratings" discloses a coupled wave analysis for Bragg diffraction of light through thick (volume-type) hologram gratings.

The product brochure for the Fujitsu SlimScan™ Holographic Slot Scanner, by Fujitsu Systems of America, (1989) discloses the SLIMSCAN 1000 holographic slot-type scanning system, wherein a holographic

scanning disc and a tube laser are used to generate an X-type scanning pattern within a single focal plane for omni-directional scanning of bar code symbols located within the scanning plane of the system.

Photon, Inc. Publication entitled "BeamScan Models 1180, 1280, 2180 Precise Measures of Beam Size and Profiles" describes several instruments sold by Photon, Inc. which can be used to profile the beam characteristics of laser beams during the manufacture of the holographic scanning systems of the present invention and the subcomponents thereof.

IBM Journal of Research and Development, entitled "Holography in the IBM 3687 Supermarket Scanner, by L.D. Dickson, G.T. Sincerbox and A.D. Wolfheimer discloses the IBM 3687 Supermarket Scanning System, wherein a holographic scanning disc having twenty-one facets and HeNe laser tube are used to generate a dense, twenty-line scanning pattern within a depth of field of 155 mm, with a laser beam spot size of less than 0.25mm.

A separate listing of the above references on PTO Form 1449 and a copy of these references are enclosed herewith for the convenience of the Examiner.

Enclosed is a check (TJP, Esq. No. 332) for $230, the requisite filing fee. The Commissioner is also hereby authorized to charge any fees or to credit any overpayment to Deposit Account No. 16-1340.

Respectfully submitted,

Dated: August 20, 1998

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